Stock Price Movement Through Technical Analysis: Empirical Evidence From The Information Technology Sector

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ABSTRACT

Technical analysis is the study of historic price movements of securities, trading volumes, and market action, primarily through the use of charts for the purpose of forecasting future price trends. Through technical indicators, investors can analyze the short-term price movement of the stock, the most important market turning points and project the price movement .This paper attempts to apply technical analysis on five selective stocks of the Information technology sector such as Tata Consultancy Services (TCS), Hindustan Computers Limited Technologies (HCL), Infosys, Wipro and Polaris, which would help the investors to identify the current trends and risks associated with the scrip at par with the market. This study is only based on secondary data which had been collected from NSE website, journals and magazines. The technical indicators have been analyzed by using twelve months share prices of the companies, which was for the period of January - December 2011. The various techniques such as Relative Strength Index, Bollinger Bands, Moving Average Convergence Divergence and Simple Moving Average were used to take a decision on whether to buy or sell the stocks of the IT sector.

Keywords: Moving Averages, Price Movement, Stock Price, Technical Analysis, IT Sector, Relative Strength Index, Bollinger Bands, Moving Average Convergence Divergence , Simple Moving Average

INTRODUCTION

Technical Analysis helps to predict the direction of share price movement through the study of past market data, primarily price and volume. Technical analysts consider that prices of the securities are determined largely by forces of demand and supply. The technical analysts use charts, graphs, trends and moving averages to predict the direction and magnitude of price changes. Pring (2002), a leading technical analyst, provided a more specific definition that the trends are determined by the changing attitudes of investors towards the different economic, monetary, political, and psychological factors. However, sometimes, the share price of the company is subject to be influenced by investor sentiments. Hence, the investors are required to consider the following factors while conducting Technical Analysis :

- ❖ Budget news;
- ❖ Announcement of Election news;
- ❖ Changes occurring in the Parliament;
- ❖ Announcement of company results;
- ❖ Changes that have occurred in the management of a company;
- ❖ Announcement of Stock Split, Rights Issue, Bonus;
- ❖ Change of interest rate by RBI (Reserve Bank of India).

This paper focuses on the different trends and patterns that can be identified within the stock market. These patterns can take shape over any time horizon, whether it is days, weeks, months or years.

OBJECTIVES OF THE STUDY

- ❖ To analyze the potential price movement of selective IT stocks through various technical indicators.

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❖ To perform a relative strength index of IT stocks with CNX IT index.
❖ To predict the share price movement through moving averages.
❖ To suggest profitable short term investment trading strategies for investors.

REVIEW OF LITERATURE

According to Banz (1981), the small stocks (having low market capitalization) tend to outperform big stocks (having high market capitalization), resulting in a size effect in the stock market.

Brown and Jennings (1989) demonstrated that under a noisy rational expectations model, in which current prices do not fully reveal private information (signals) because of noise (unobserved current supply of a risky asset) in the current equilibrium price, historical prices (i.e., technical analysis) together with current prices help traders make more precise inferences about past and present signals than do current prices alone.

Taylor and Allen (1992) conducted a survey on the use of technical analysis among chief foreign exchange dealers in the London market in 1988. The results indicated that 64% of the respondents reported using moving averages and/or other trend-following systems and 40% reported using other trading systems such as momentum indicators or oscillators. In addition, approximately 90% of the respondents reported that they were using some technical analysis when forming their exchange rate expectations at the shortest horizons (intraday to one week), with 60% viewing technical analysis to be at least as important as fundamental analysis.

Lui and Mole (1998) surveyed the use of technical and fundamental analysis by foreign exchange dealers in Hong Kong in 1995. The dealers believed that technical analysis was more useful than fundamental analysis in forecasting both trends and turning points. Similar to previous survey results, technical analysis appeared to be important to dealers at shorter time horizons of up to 6 months. Respondents considered moving averages and/or other trend-following systems to be the most useful for technical analysis. The typical length of a historical period used by the dealers was 12 months, and the most popular data frequency was daily data.

Osler (2001) provided a micro structural explanation for the success of two familiar predictions from technical analysis: **(1)** Trends tend to be reversed at predictable support and resistance levels, and **(2)** Trends gain momentum once predictable support and resistance levels are crossed. The explanation is based on a close examination of stop-loss and take-profit orders at a large foreign exchange dealing bank. Take-profit orders tend to reflect price trends, and stop-loss orders tend to intensify trends. The requested execution rates of these orders are strongly clustered at round numbers, which are often used as support and resistance levels. Significantly, there are marked differences between the clustering patterns of stop-loss and take-profit orders, and between the patterns of stop-loss buy and stop-loss sell orders. These differences explain the success of the two predictions.

Gupta (2003) examined the perceptions about the main sources of his worries concerning the stock market. A sample comprising of middle-class households spread over 21 states/union territories was considered for the study. The study revealed that the foremost cause of worry for household investors was fraudulent company management, too much volatility was given the second rank, and the third rank was given to too much price manipulation.

Ravindra and Wang (2006) examined the relationship of trading volume to stock indices in Asian markets. Stock market indices from six developing markets in Asia were analyzed over a 34 months period ending in October 2005. In the South Korean market, the causality extends from the stock indices to trading volume, while the causality was the opposite in the Taiwanese market. Mehta and Chander (2010) said that any kind of inconsistency in the behavior of the return series of the stock indices resulting due to these effects may result in profitable opportunity for the investors and fund managers.

Chitra (2011) observed that investors must also take into account various factors like Union Budget, company performance, political and social events, climatic conditions, etc. before taking a decision of investing in stocks. The scrip should also be fundamentally good. Therefore, it's advisable for a trader or investor to make technical analysis of stocks for better return of investments.

RESEARCH METHODOLOGY

❖ **Methods of Data Collection:** The research is fully based upon secondary data, and hence, the data has been collected from NSE India and various websites. The data was collected for the period of January - December 2011.The

short term price movement of Tata Consultancy Services (TCS), Hindustan Computers Limited (HCL), Infosys, Wipro, and Polaris was analyzed by using 12 months share price of the company.

❖ **Sample Size :** Five IT companies were considered from the IT sector to analyze the short-term price movement of the companies, the name of the companies are given below :
❖ Tata Consultancy Services (TCS) ; Hindustan Computers Limited (HCL); Infosys; Wipro ; Polaris

❖ **CNX IT Index :** The Information Technology (IT) industry has played a most important role for the development of the Indian economy during the last few years. CNX IT provides investors and market intermediaries with an appropriate benchmark that captures the performance of the IT segment of the market. The CNX IT sector index includes companies that have more than 50% of their turnover from IT-related activities like IT Infrastructure, IT Education and Software Training, Telecommunication Services and Networking Infrastructure, Software Development, Hardware Manufacturers, Vending support and Maintenance.

❖ **Tools and Techniques Used:** Statistical Package For Social Sciences (SPSS) was used to analyze the data .The following tools were applied :
1) Coefficient of variation;
2) Correlation;
3) Regression;
4) Simple Moving Average;
5) Moving Averages;
6) Trend

❖ **Technical Indicators:** Various technical indicators were also used to analyze the short term share price movement of the companies, and the list of the indicators is as follows :
1) Relative Strength Index (RSI);
2) MACD;
3) Bollinger Bands

❖ **Relative Strength Index (RSI):** Relative Strength Index (RSI) is a momentum oscillator that measures the speed and change of price movements. RSI oscillates between 0 and 100. Traditionally, and according to Wilder, RSI is considered overbought when above 70 and oversold when below 30. Signals can also be generated by looking for divergences, failure swings and centerline crossovers. RSI can also be used to identify the general trend.
The formula for RSI is :

$$RSI = 100 - \frac{100}{1 + RS}$$

$$RS = \text{Average Gain} / \text{Average Loss}$$

❖ **Moving Average Convergence-Divergence (MACD):** The MACD indicator is the difference between two exponential moving averages (12 and 26 as default) and also has a signal trigger or timing line (9 day EMA as default). The MACD is all about the convergence and divergence of the two moving averages. Convergence occurs when the moving averages move towards each other. Divergence occurs when the moving averages move away from each other. The shorter moving average (12-day) is faster and is responsible for most MACD movements. The longer moving average (26-day) is slower and less reactive to price changes in the underlying security. The MACD Line oscillates above and below the zero line, which is also known as the centerline. These crossovers signal that the 12-day EMA has crossed the 26-day EMA. The direction, of course, depends upon direction of the moving average cross. Positive MACD indicates that the 12-day EMA is above the 26-day EMA.

❖ **Bollinger Bands :** Bollinger Bands are volatility bands placed above and below a moving average. Volatility is based on the standard deviation, which changes as volatility increases and decreases. The bands automatically widen when volatility increases and narrow when volatility decreases. This dynamic nature of Bollinger Bands also means that

they can be used on different securities with the standard settings. For signals, Bollinger Bands can be used to identify M-Tops and W-Bottoms or to determine the strength of the trend.
Formula to calculate Bollinger Bands :

*** Middle Band = 20-day simple moving average (SMA)**

*** Upper Band = 20-day SMA + (20-day standard deviation of price x 2)**

*** Lower Band = 20-day SMA - (20-day standard deviation of price x 2)**

Bollinger Bands consist of a middle band with two outer bands. The middle band is a Simple Moving Average that is usually set at 20 periods. A Simple Moving Average is used because the same is also used in the standard deviation formula. The look-back period for the standard deviation is the same as for the simple moving average. The outer bands are usually set 2 standard deviations above and below the middle band.

ANALYSIS AND INTERPRETATION

❖ **Coefficient of Variation:** Coefficient of Variation helps to find out how big the security's variance really is relative to the price of the stock. It compares the risks of assets with varying averages to their expected returns. The coefficient of variation divides a security's standard deviation by its mean (average) price and multiplies it by 100, i.e:

$$C.V = \frac{\sigma}{\bar{X}} X100$$

Table 1: Descriptive Information For The Sample Companies' Price

Various Company Price	Mean	Std. Deviation	Variance	C.V
Hindustan Computers Limited (HCL) Price	454.8322	44.11549	1946.176	9.70
Polaris Price	163.2996	28.45565	809.724	17.43
Infosys Price	2828.1773	282.83209	79993.991	10.00
Wipro Price	408.6472	44.80209	2007.227	10.96
Tata Consultancy Services (TCS) Price	1116.7486	63.48844	4030.783	5.67
CNX Price	6375.9289	570.73017	325732.925	
Source: Computation based on NSE data				

From the Table 1, it can be inferred that TCS's share price is better and less risky as compared to the share prices of its peer companies as the Coefficient of Variation for TCS is very less as compared to others.

Table 2: Correlation Between IT Companies' Share Prices And CNX Price Index

		HCL	POLARIS PRICE	INFOSYS PRICE	WIPRO PRICE	TCS	CNX PRICE
HCL	Pearson Correlation	1					
Polaris Price	Pearson Correlation	.912**	1				
	Sig. (2-tailed)	.000					
Infosys Price	Pearson Correlation	.651**	.698**	1			
	Sig. (2-tailed)	.000	.000				
Wipro Price	Pearson Correlation	.773**	.822**	.896**	1		
	Sig. (2-tailed)	.000	.000	.000			
TCS	Pearson Correlation	.672**	.563**	.722**	.784**	1	
	Sig. (2-tailed)	.000	.000	.000	.000		
CNX Price	Pearson Correlation	.770**	.798**	.979**	.951**	.789**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).							
Source: Computation based on NSE data							

❖ **Correlation Analysis**

Ho: There is no relationship between share prices of different companies and CNX price index.

The level of significance is 1%. From the Table 2, it is clear that the stock prices of Hindustan Computers Limited (HCL) , Polaris and Tata Consultancy Services (TCS) are positively correlated with the CNX price index and further, it was found that the share prices of Infosys (.979) and Wipro (.951) are positively highly correlated with the CNX price index.

❖ **Regression Analysis**

Ho: CNX Price index is independent of the share prices of the shares of Tata Consultancy Services (TCS), Polaris, Infosys, Hindustan Computers Limited (HCL) and Wipro.

Table 3: Analysis of Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.999	.998	.997	28.74694

Source: Computation based on NSE index

All the variables together explain 99.8 % (Table 3) of the variance (R - Square) for the share prices of Tata Consultancy Services (TCS), Polaris, Infosys, Hindustan Computers Limited (HCL) and Wipro, which is highly significant, as the F – value is 19344.738 in the following Table 4.

Table 4: Analysis of Variance For Regression Analysis

Model		Sum of Squares	D. f	Mean Square	F	Sig.
1	Regression	7.993E7	5	1.599E7	19344.738	.000
	Residual	199159.121	241	826.386		
	Total	8.013E7	246			

Source: Computation based on NSE index

Table 5: Coefficient Values For Regression Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	152.969	36.108	0.094	4.236	.000
	HCL price	1.324	.122	.102	10.854	.000
	Polaris price	1.202	.212	.060	5.659	.000
	Infosys price	1.357	.015	.672	91.376	.000
	Wipro price	2.062	.136	.162	15.175	.000
	TCS price	.667	.057	.074	11.662	.000

Source: Computation based on NSE data

The share prices of the IT companies mentioned in the Table 5 contribute to the prediction of the CNX Price. Since p value is less than .05, the null hypothesis is rejected. Hence, CNX price index is dependent upon the share prices of Tata Consultancy Services, Polaris , Infosys, HCL and Wipro . Thus, the t – values show that the prices contribute to the prediction of the CNX Price. 3-days simple moving average was calculated to find out the trend.

The Simple Moving Average calculates the average mean price from the last 3 days closing prices and so on. A bullish signal is generated when prices move above the moving average. A bearish signal is generated when prices move below the moving average.

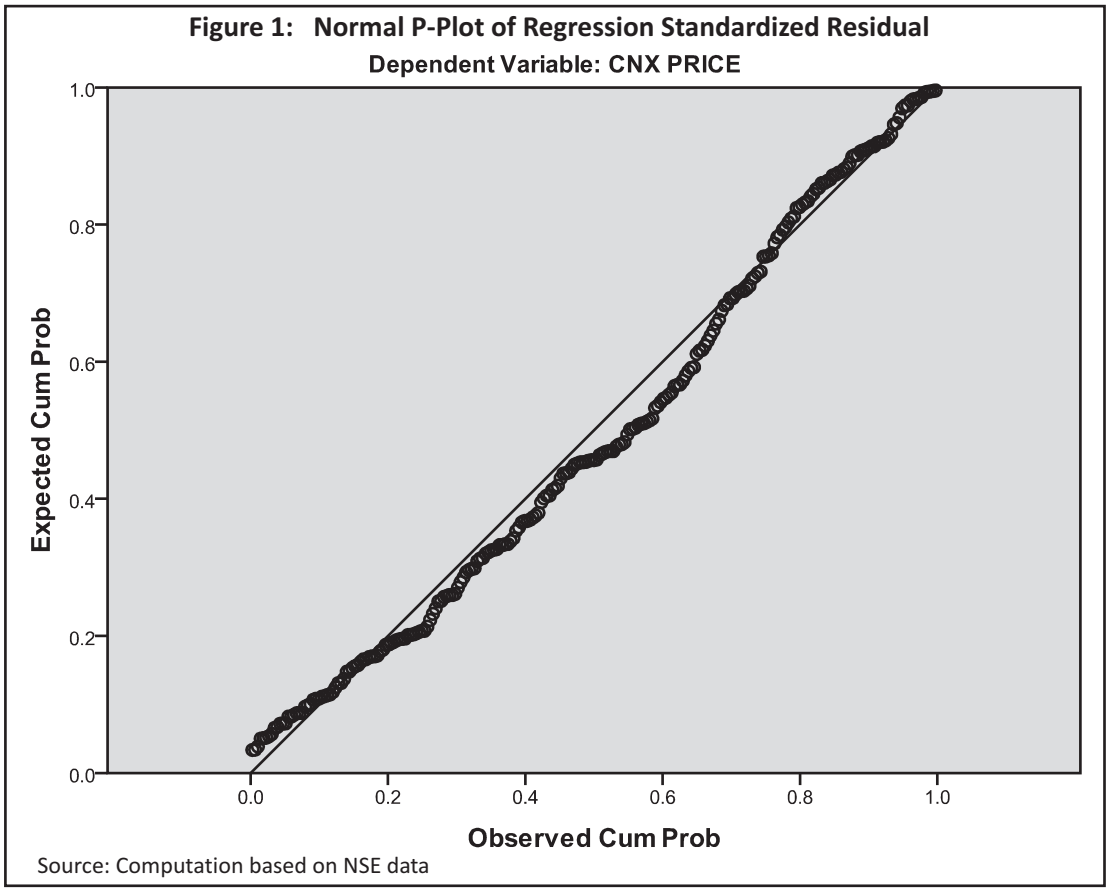


Figure 1: Normal P-Plot of Regression Standardized Residual
Dependent Variable: CNX PRICE
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0
Source: Computation based on NSE data

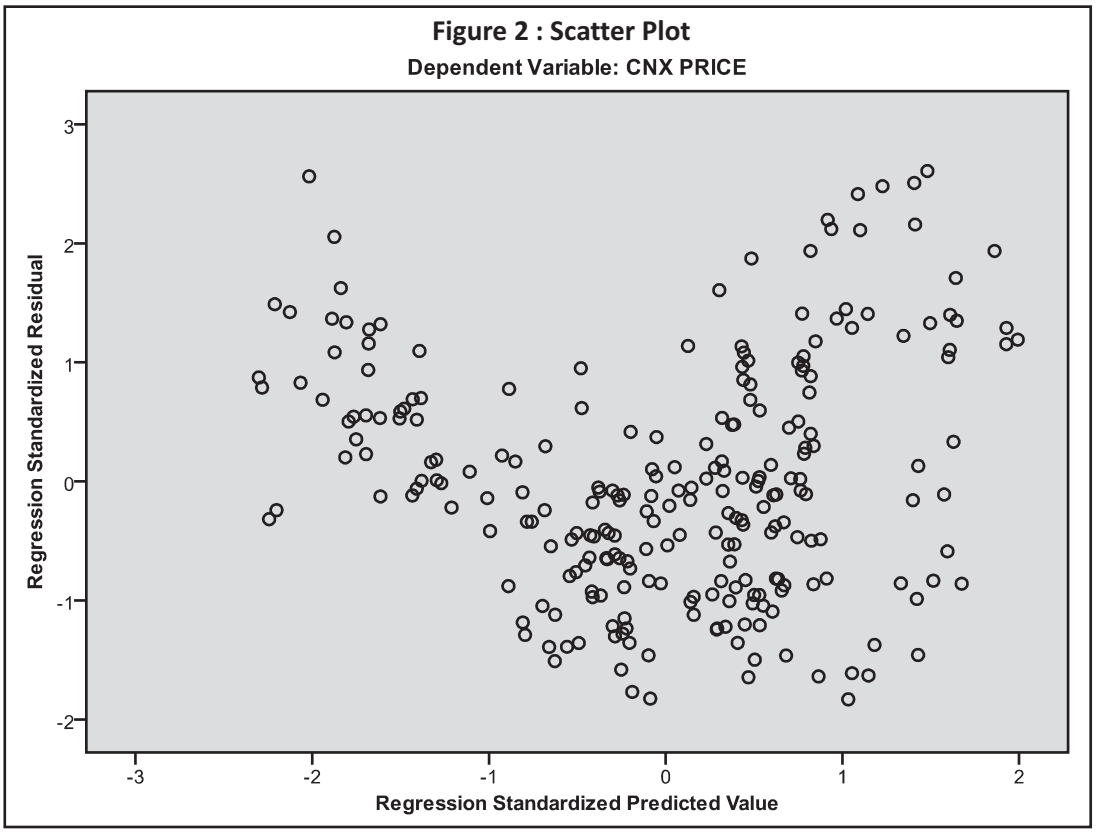
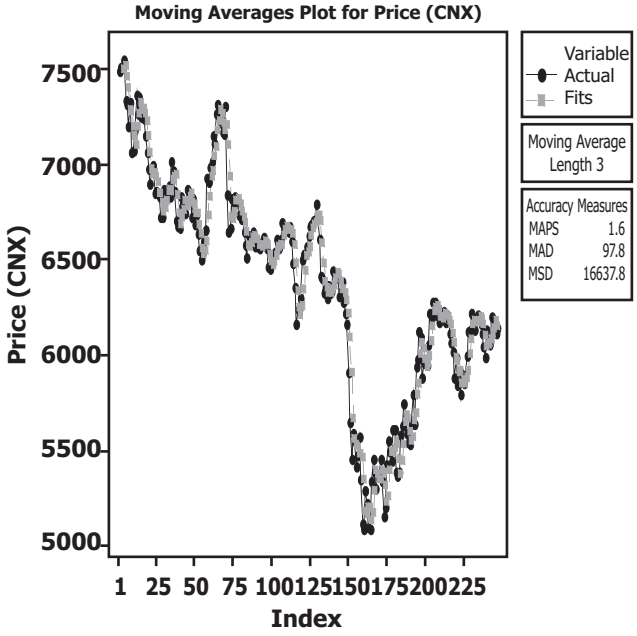


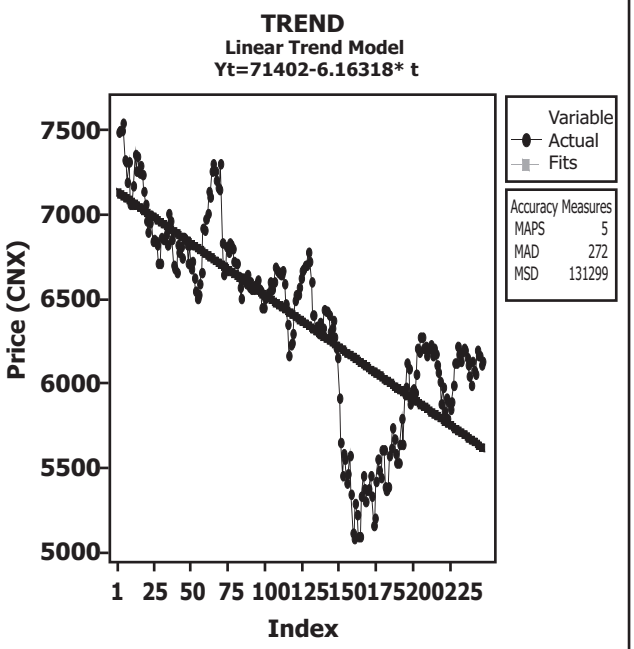
Figure 2 : Scatter Plot
Dependent Variable: CNX PRICE
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2
3
Source: Computation based on NSE data

Figure 3: Moving Average



Source: Computation based on NSE data

Figure 4: Trend

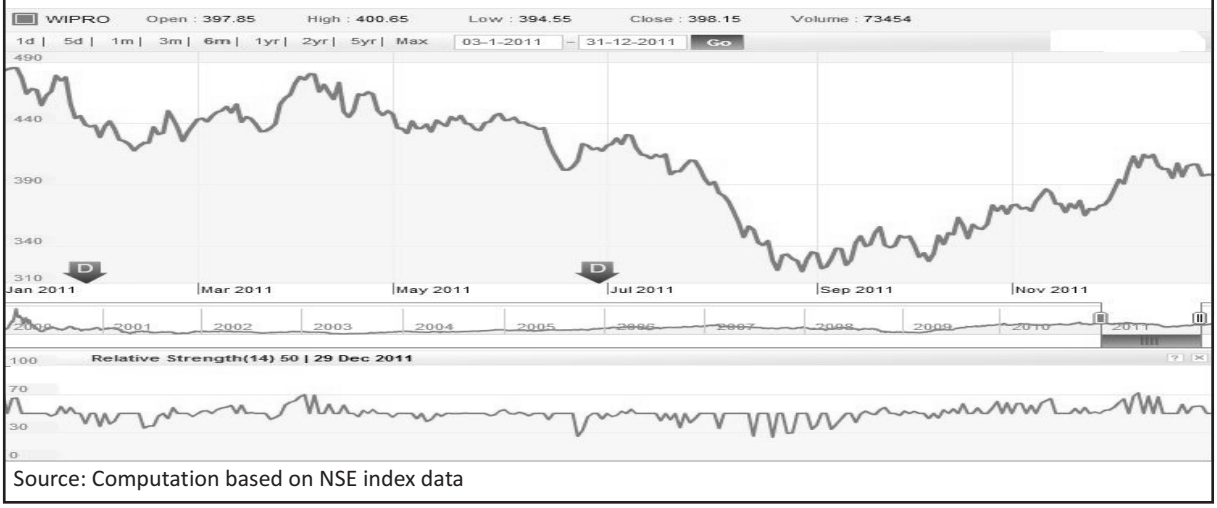


Source: Computation based on NSE data

The Figure 3 shows the 3 days moving average and the Figure 4 shows the trend line. From this, it can be concluded that the price of the CNX index was very high in the initial period of January 2011. Till the 125th day, the CNX price values were more volatile. After the 125th day, the CNX price index lost its value, and after the 202th day, it gained momentum and progressed smoothly.

❖ **Relative Strength Index (RSI) :** The following charts (Figures 5 -9) show the Relative Strength Index of the five IT companies.

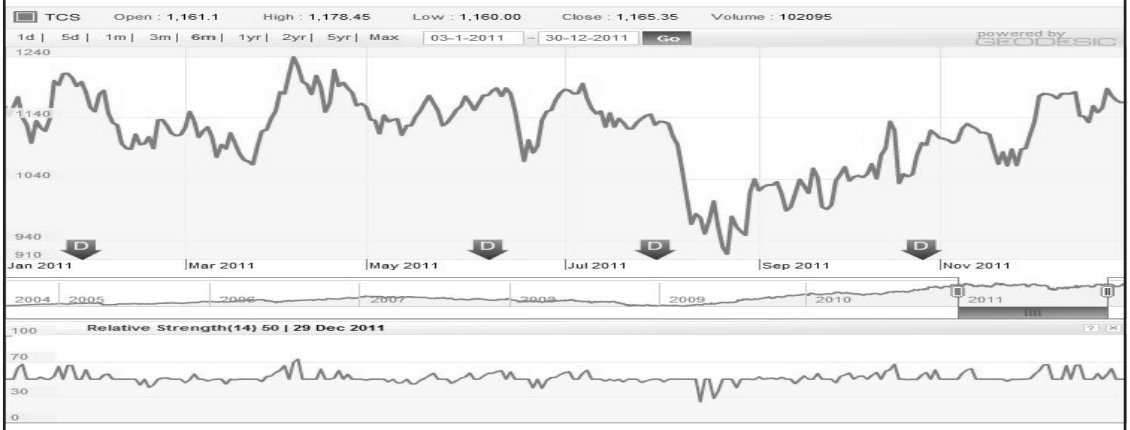
Figure 5: Wipro - Relative Strength Index



Source: Computation based on NSE index data

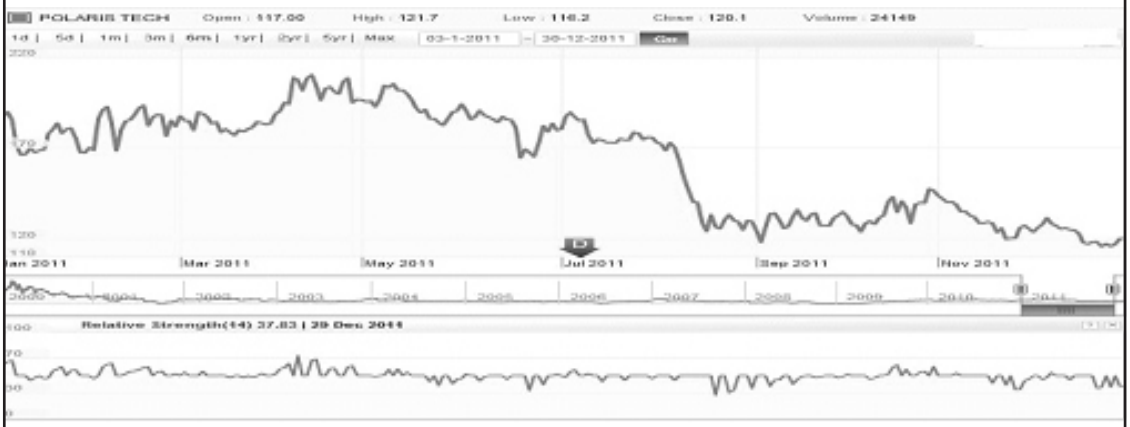
From the Figure 5, it is clear that the RSI of Wipro for the period from January – December 2011 stood at 50. This indicates that the prices of the stocks of the company were neither overbought nor oversold.
From the Figure 6, it is clear that the RSI of Tata Consultancy Services for the period from January – December 2011

Figure 6: Tata Consultancy Services (TCS) - Relative Strength Index



Source: Computation based on NSE index data

Figure 7: Polaris - Relative Strength Index



Source: Computation based on NSE index data

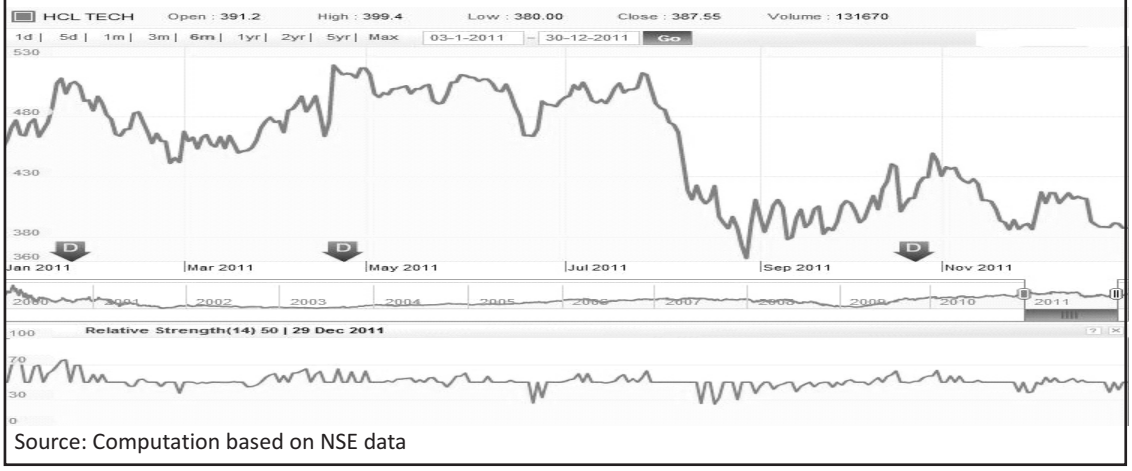
Figure 8: Infosys – Relative Strength Index

Source: Computation based on NSE index data

stood at 50. This indicates that prices of the stocks of the company were neither overbought nor oversold. From the Figure 7, it is clear that the RSI of Polaris for the period from January – December 2011 stood at 37.83. This indicates that prices of the stocks of the company were oversold. Investors can accumulate this stock for future gains. From the Figure 8, it is clear that the RSI of Infosys for the period January – December 2011 stood at 57.51. This

indicates that prices of the stocks of the company were slightly in the overbought position.

Figure 9: Hindustan Computers Limited (HCL) – Relative Strength Index

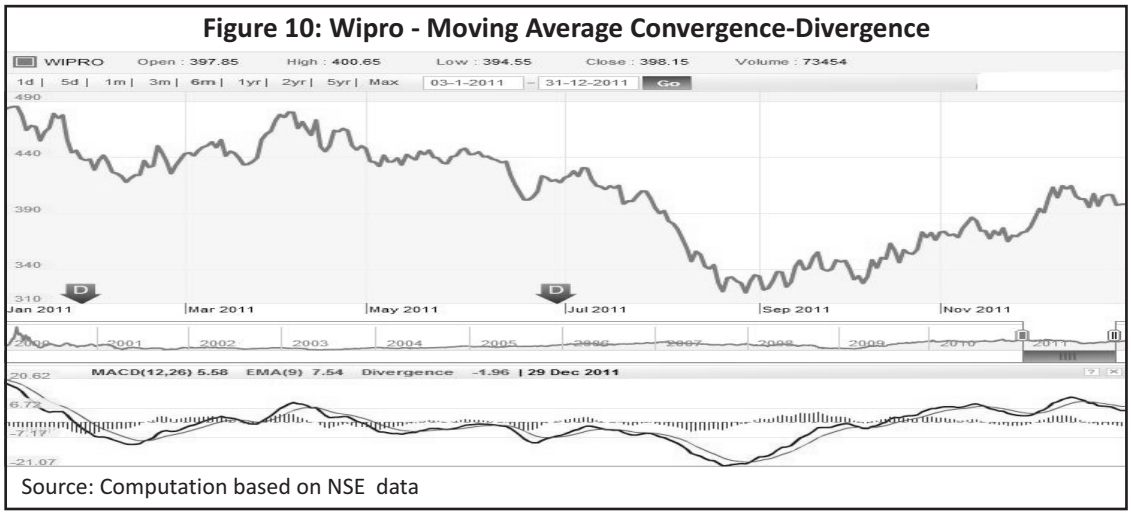


Source: Computation based on NSE data

It can be inferred from the Figure 9 that the RSI of HCL for the period from January – December 2011 stood at 50. This indicates that prices of the stocks of the company were neither overbought nor oversold.

❖ **Moving Average Convergence-Divergence (MACD) :** The following figures (Figures 10 - 14) show the Moving Average Convergence-Divergence of the five sample IT companies.

Figure 10: Wipro - Moving Average Convergence-Divergence



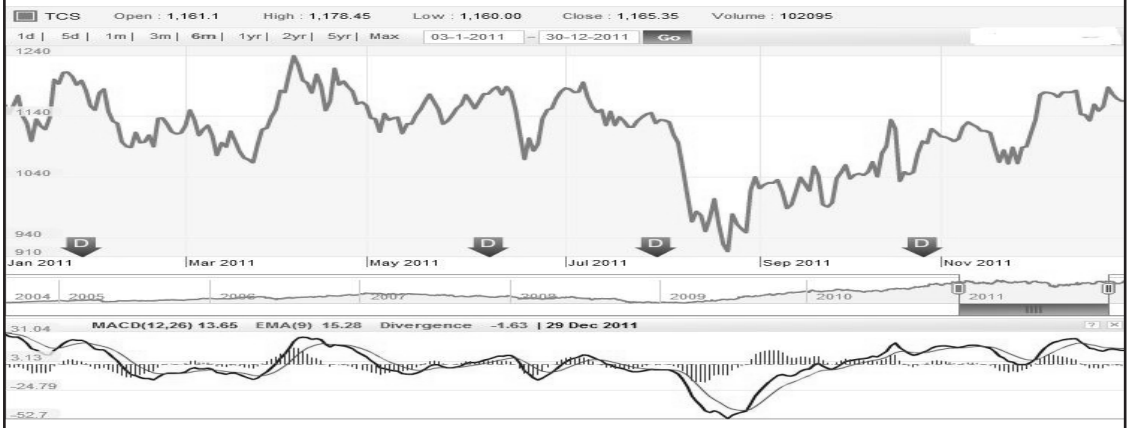
Source: Computation based on NSE data

The Figure 10 shows Wipro's MACD with its 12-day EMA and 26-day EMA, and it is noted that there are two bearish crossover lines for the chosen period. It is also noted that there is a negative divergence of 1.96. However, the scrip looks to continue to move to higher levels, irrespective of such signals. There is more upward momentum for the stock as compared to the downward momentum.

The Figure 11 shows TCS's MACD with its 12-day and 26-day EMA, and it is noted that there are three bearish cross over lines for the chosen period. It is also noted that there is a negative divergence of 1.63. Therefore, the scrip was moving very flat. It is also noted that there was a huge volatility of the stock for the period from January – December 2011.

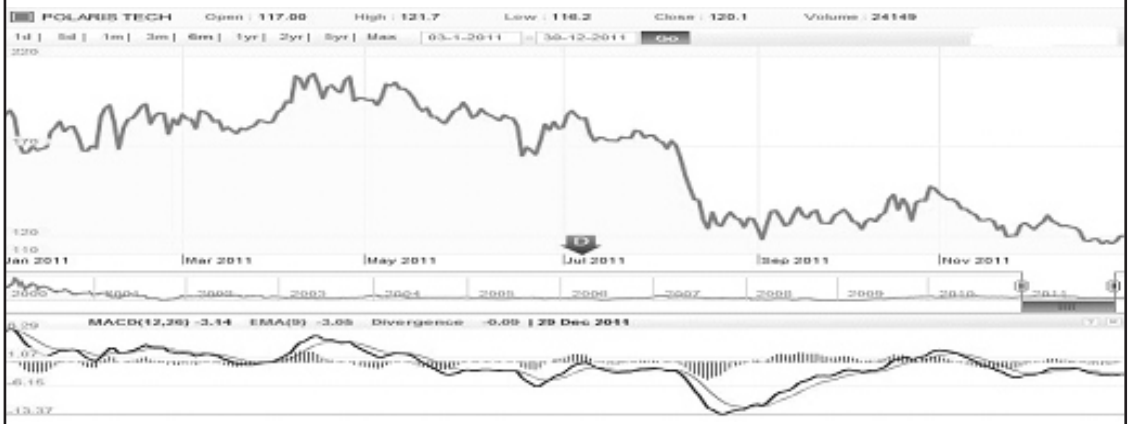
The Figure 12 shows Polaris's MACD with its 12-day and 26-day EMA. It is noted that there are three bearish cross over lines for the chosen period. It is further identified that there is a negative divergence of 0.09. However, the value of scrip had been coming down consistently. During such a period, investors are advised to cautiously sell their holding

Figure 11: Tata Consultancy Services (TCS) - Moving Average Convergence-Divergence



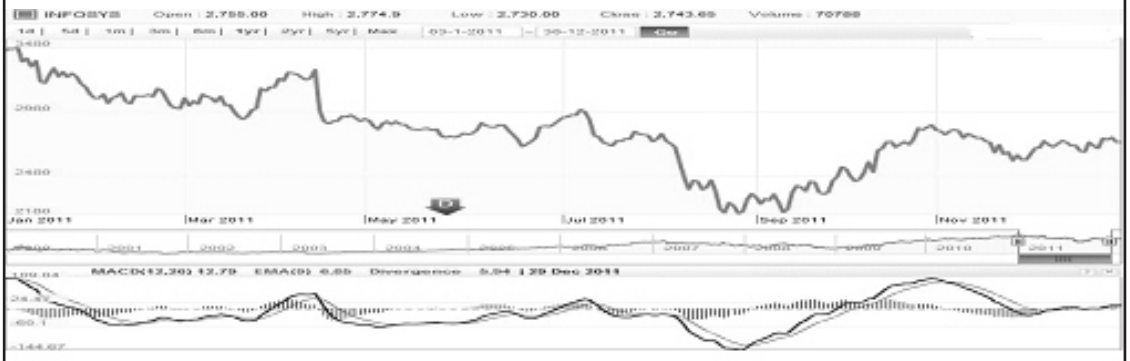
Source: Computation based on NSE data

Figure 12: Polaris - Moving Average Convergence-Divergence



Source: Computation based on NSE data

Figure 13: Infosys - Moving Average Convergence-Divergence

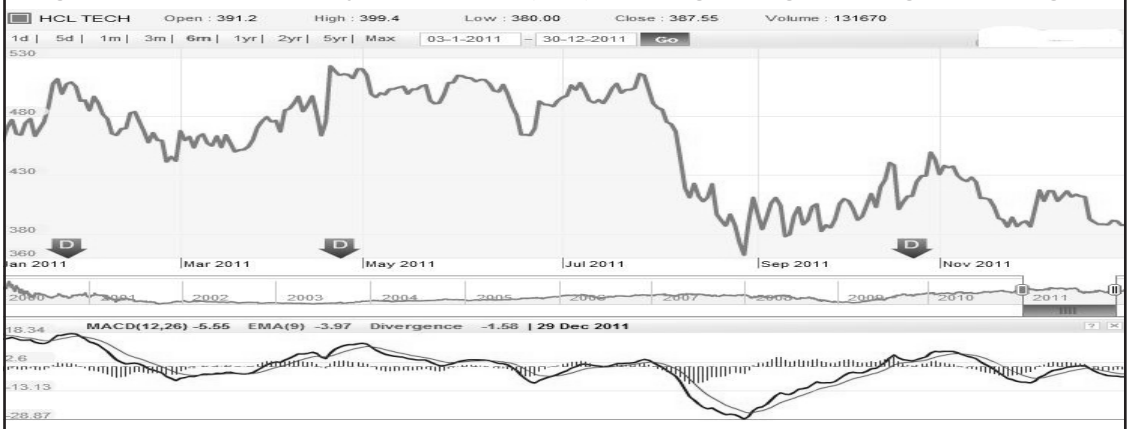


Source: Computation based on NSE data

positions and can re-enter the stock market when the price levels get consolidated. This also signals that there is a weak signal for the stock market in the near future.

The Figure 13 shows Infosys's MACD with its 12-day EMA and 26-day EMA. It is noted that there are three bearish crossover lines for the chosen period. The scrip has a positive divergence of 5.94. The value of the stock recovered from the year low and was expected to touch the year high. Investors can look forward to invest in the scrip, once the

Figure 14: Hindustan Computers Limited (HCL) - Moving Average Convergence-Divergence

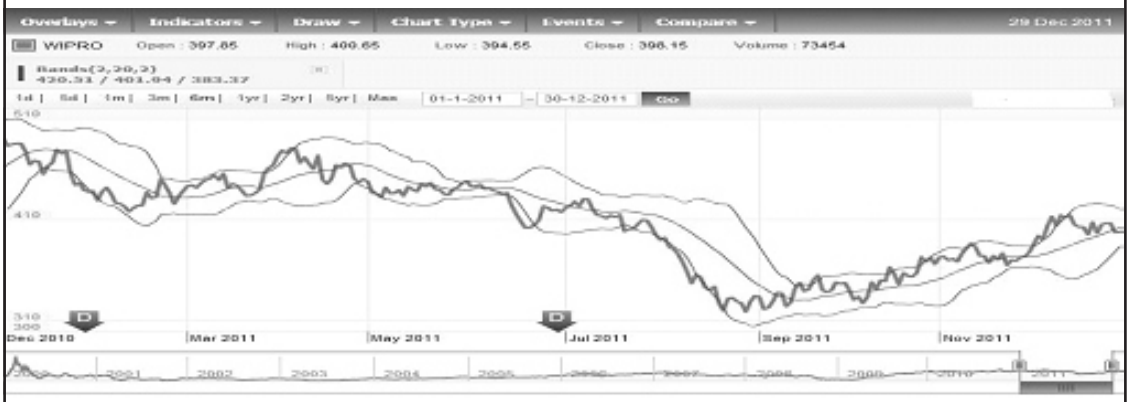


Source: Computation based on NSE data

value is consolidated.

The Figure 14 shows Hindustan Computers Limited's (HCL) MACD with its 12-day and 26-day EMA. It is noted that there are three bearish crossover lines for the chosen period. Moreover, the scrip has a negative divergence of 1.58. The value of scrip has also been coming down consistently. During such a period, investors are advised to cautiously hold

Figure 15: Wipro – Bollinger Bands



Source: Computation based on NSE data

Figure 16: Tata Consultancy Services (TCS) – Bollinger Bands

Source: Computation based on NSE data

their position till a proper outlook is received for this scrip.

❖ **Bollinger Bands :** The following figures (Figures 15 - 19) show the Bollinger Bands of the five sample IT companies. It is identified from the Figure 15 that there is a M – top formation during the period from March – April, 2011. From there on, the scrip lost value until September 2011, were the researchers identified a W – bottom formation. During this time period, the stock started to move in the positive territory and appreciated in value over a period of time.

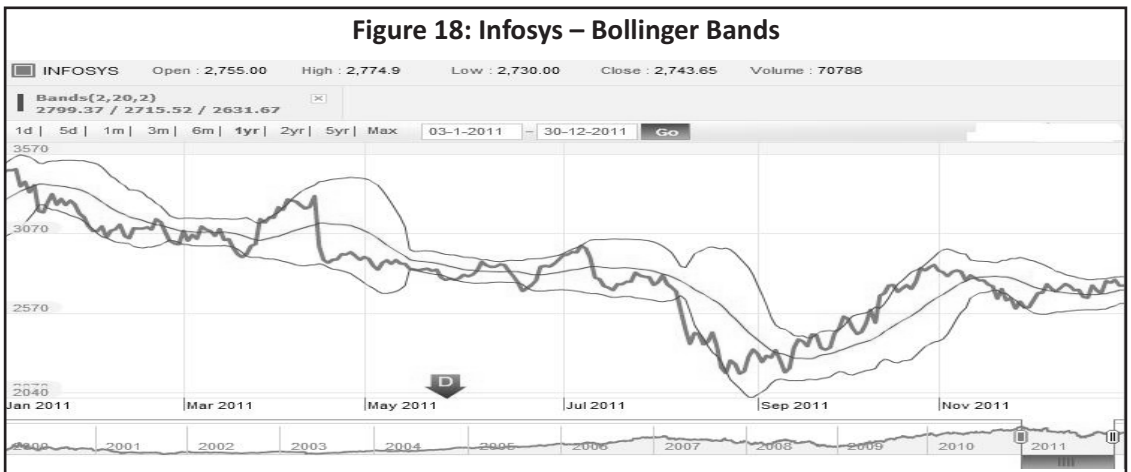
It is identified from the Figure 16 that there is a M – top formation during the period from July – August 2011, from there on, the scrip lost in value, however, from September 2011, the stock recovered from the downward trend and consistently moved up.

Figure 17: Polaris – Bollinger Bands

Source: Computation based on NSE data

It is identified from the Figure 17 that there is a M – top formation during the period from June – July 2011. From there on, the scrip lost in value, and then, the scrip entered in the consolidation stage. Investors can slowly accumulate the stock when it is in such a stage.

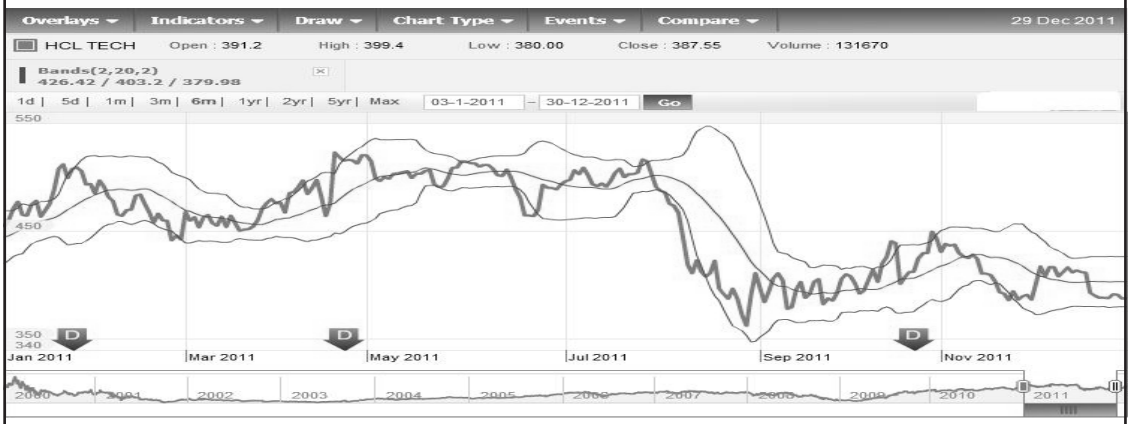
Figure 18: Infosys – Bollinger Bands



Source: Computation based on NSE data

It is identified from the Figure 18 that there is a W – bottom formation during the period from August – September 2011. From there on, the scrip gained considerable amount in value, and entered into the consolidation stage. During such a period, investors can purchase the stock with a medium to long term holding.

Figure 19: Hindustan Computers Limited (HCL) – Bollinger Bands



Source: Computation based on NSE data

It is identified from the Figure 19 that there is a M – top formation during the period from July – August 2011, and from there on, the scrip lost value.

FINDINGS

❖ The share price of Tata Consultancy Services (TCS) is much better when compared with other chosen scrip prices. This is due to the lesser Coefficient of Variation.

❖ The stock price of Hindustan Computers Limited (HCL), Polaris and Tata Consultancy Services (TCS) are positively correlated with the CNX price index and further, it was found that the share price of Infosys (0.979) and Wipro(0.951) are positively highly correlated with the CNX price index.

❖ The CNX price index is more volatile, after the 125th day, the CNX price index lost its value, and after the 202th day, it gained momentum and progressed very smoothly.

❖ The RSI of Wipro, Tata Consultancy Services (TCS) and Hindustan Computers Limited (HCL) for the period from January – December 2011 stood at 50, which indicates that the share prices of the companies were neither overbought nor oversold. The RSI of Polaris is 37.83, which is a signal for the bullish phase, and share prices of the company are oversold. During such a period, the investors can accumulate this stock for future gains. The RSI of Infosys is 57.51, which indicates that the price of the shares of the company are slightly in the overbought position.

❖ **MACD Shows That :** Wipro stock prices have more upward momentum when compared with the downward momentum. Tata Consultancy Services's (TCS) scrip moved quite flatly. It was also found that there is a huge volatility of the stock. Polaris scrip had been coming down consistently. During such a period, investors are advised to cautiously sell their holding positions and can re-enter the market when the price levels have consolidated. The stock prices of Infosys recovered considerably from the year low and were expected to touch the year highs. Investors can look forward to invest in the scrip.

❖ **Bollinger Bands Show That :** The charts shows that the share prices of Wipro during the period from March – April 2011 lost value after September 2011 .The stock price started to move in the positive territory and would appreciate in value in the future. It was found that the share prices of Tata Consultancy Services (TCS) during the period from July – August 2011 lost value; however, since September 11, the stock recovered from the downward trend and consistently moved up. In case of Polaris, during the period from June – July 2011, the scrip lost in value; the scrip was now in the consolidation stage. During such a period, the investors can slowly accumulate the stocks in the current level. In case of Infosys, during the period from August – September 2011, the scrip gained a considerable amount in value and was in the consolidation stage, so, during such a period, the investors can buy the stock with a medium to long term holding. It was found that for HCL's Bollinger Bands chart, there is a M – top formation during the period from July –

August 2011, and from that period onwards, the scrip lost out in terms of value.

SUGGESTIONS

❖ The investment decisions of the investors are mostly based on the risk appetite of the investors. Hence, the investments made should fetch considerable returns. During technical analysis, investors use various indicators to understand and forecast the future price movements of the selected stocks.

❖ Since the RSI of Polaris is in the oversold category, investors can buy and hold the stock for the future. Similarly, it is identified from MACD that there is a bullish crossover line in the month of December 11 which adds that investors consistently accumulate at lower levels. This stock can be purchased at around the 120 level.

❖ When compared with the MACD of Infosys, there is a bullish crossover line as the value of the stock recovered from the year low and was expected to touch the year highs. Investors can look forward to invest in the scrip, once the value is consolidated. Investors who wanted to buy this stock can accumulate it at the 2,700 levels.

❖ Investors can also look forward to invest in Tata Consultancy Services (TCS) stocks due to the lesser Coefficient of Variation. Moreover, it is identified that there is a M – top formation during the period from March – April 2011, from there on, the scrip lost in value until September 2011, were the researchers identified a W – bottom formation. The stock started to move in the positive territory and would appreciate in value over a period of time. TCS stocks look very attractive at a price of ₹ 1,100.

❖ From the analysis, it is noted that Polaris, Infosys and TCS stocks tend to perform much better in the future as compared to other stocks. Investors can invest in these scrips so that they can make a considerable amount of profit in the short term.

CONCLUSION

The share prices of a company are subject to be influenced by investors' sentiments. Hence, the investors are required to consider the various factors which may affect the psychology of the investors while conducting Technical Analysis. The present study is an asset for investors who are interested to understand short-term price movement of potential stocks in the IT sector and then formulate investment strategies. However, further analysis of various technical indicators is desirable for better understanding of the movement of stock prices, returns and to devise economically feasible trading strategies.

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